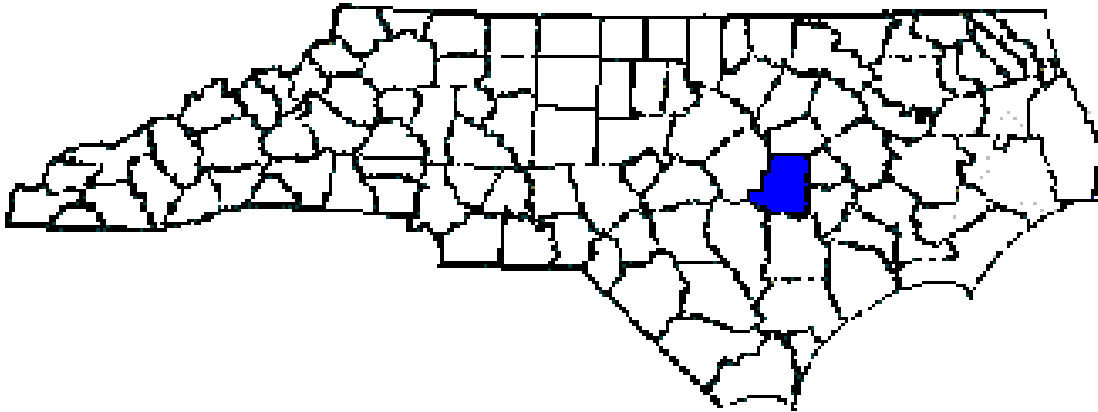
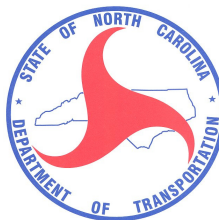


# ANNUAL REPORT FOR 2010



**Unnamed Tributary to Howell Branch  
Wayne County  
TIP No. R-2554BA – Site 5**



Prepared By:  
Roadside Environmental Unit & Natural Environment Unit  
North Carolina Department of Transportation  
October 2010

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Appendix A – Cross Section Comparisons & Longitudinal Profile

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## **SUMMARY**

The following report summarizes the stream monitoring activities that have occurred during 2010 at the UT to Howell Branch Mitigation Site in Wayne County. The site was constructed during 2009 by the North Carolina Department of Transportation (NCDOT). This report provides the monitoring results for the first formal year of monitoring (Year 2010). The Year 2010 monitoring period is the first of five scheduled years for monitoring on UT to Howell Branch (See Success Criteria Section 2.1).

Based on the overall conclusions of monitoring along UT to Howell Branch, the site has not met the required monitoring protocols for the first formal year of monitoring. Based on comparing the first year of monitoring data to the as-built data, the channel is stable throughout the stream at this time. The streambank and buffer are not meeting planted vegetation success criteria for the first year of monitoring. NCDOT plans to replant the site by March 2011.

NCDOT will continue stream monitoring at the UT to Howell Branch Mitigation Site for 2011.

## **1.0 INTRODUCTION**

### **1.1 Project Description**

The following report summarizes the stream monitoring activities that have occurred during 2010 at the UT to Howell Branch Mitigation Site. The site is located immediately south of SR 1571 (Tommy's Road) in Goldsboro, NC (Figure 1). UT to Howell Branch Mitigation Site was constructed to provide mitigation for stream impacts associated with Transportation Improvement Program (TIP) number R-2554BA in Wayne County.

The mitigation project covers approximately 561 linear feet of stream relocation. Construction was completed in January 2010 by the North Carolina Department of Transportation (NCDOT). Stream restoration involved the installation of rock cross vanes, rock vanes, construction of a new stream channel and construction of the floodplain to allow for overbank flooding. It also included the installation of coir fiber matting and live stakes along the streambank and bareroot seedlings in the buffer area.

### **1.2 Purpose**

In order for a mitigation site to be considered successful, the site must meet the success criteria. This report details the monitoring in 2010 at the UT to Howell Branch Mitigation Site. Hydrologic monitoring was not required for the site.

### **1.3 Project History**

January 2010	Construction Completed
October 2010	Stream Channel Monitoring (Year 1)

### **1.4 Debit Ledger**

The entire UT to Howell Branch stream mitigation site was used for the R-2554BA project to compensate for unavoidable stream impacts.



**Figure 1.** Site Location Map

## **2.0 STREAM ASSESSMENT**

### **2.1 Success Criteria**

The stream mitigation site shall be monitored for five years or until success criteria are satisfied. Monitoring protocols shall follow the Monitoring Level I outlined in the Stream Mitigation Guidelines, April 2003. NCDOT will evaluate the success of the stream relocation project based on guidance provided by the Stream Mitigation Guidelines disseminated by the United States Army Corps of Engineers-Wilmington District. The survey of channel dimension will consist of permanent cross sections placed at approximately four cross sections (two riffles and two pools). Annual photographs showing both banks and upstream and downstream views will be taken from permanent, mapped photo points. The survey of the longitudinal profile will represent distinct areas of the stream and will cover a cumulative total of 535 linear feet of channel. The entire restored length of stream will be investigated for channel stability and in-stream structure functionality. Any evidence of channel instability will be identified, mapped and photographed.

#### **Vegetation Success**

For the onsite buffer mitigation sites, the permittee shall monitor the sites for five years. An annual report shall be submitted to the DWQ for a period of 5 years showing monitoring results, survival rate, success of tree and vegetation establishment, and that diffuse flow through the riparian buffer has been maintained. The first annual report shall be submitted within one year of final planting. Failure to achieve a buffer density of 320 trees per acre after 5 years will require the annual report to provide appropriate remedial actions to be implemented and a schedule for implementation. Approval of the final annual report, and a formal "close out" of the mitigation site by the DWQ is required. The success of vegetation plantings will be measured through stem counts. Permanent quadrants will be used to sample the riparian buffer. Survival of the live stakes will be determined by visual observation throughout the 5 year monitoring period.

Bareroot vegetation will be evaluated using 2 staked survival plots. Plots will be 50 ft. by 50 ft. or 100 ft. by 25 ft. and flagged stems will be counted in these plots. Success will be defined as 320 stems per acre after 5 years. All vegetation monitoring will be conducted during the growing season.

### **2.2 Stream Description**

#### **2.2.1 Post-Construction Conditions**

The mitigation project covers approximately 561 linear feet of stream relocation. Construction was completed in January 2010 by the North Carolina Department of Transportation (NCDOT). Stream restoration involved the installation of rock cross vanes, rock vanes, construction of a new stream channel and construction of the floodplain to allow for overbank flooding. It also included the installation of coir fiber matting and live stakes along the streambank and bareroot seedlings in the buffer area.

### **2.2.2 Monitoring Conditions**

The objective of the UT to Howell Branch Mitigation Site relocation was to build a C5 stream type as identified in the Rosgen's Applied River Morphology. A total of four cross sections (two in a riffle, two in a pool) were surveyed. For this report, only cross sections containing riffles were used in the comparison of channel morphology in Table 1.

<b>Table 1. Abbreviated Morphological Summary (UT to Howell Branch - Site 5 Cross Sections #1 and #3)</b>				
<b>Variable</b>	<b>As Built</b>	<b>Cross Section #1 (Riffle)</b>	<b>Cross Section #3 (Riffle)</b>	<b>Min. - Max Values (Riffle Sections Only)</b>
		<b>2010</b>	<b>2010</b>	<b>2010</b>
Drainage Area (sq. mi)	0.17	0.17	0.17	0.17
Bankfull Width (ft)	9.0	10	12.12	10 - 12.12
Bankfull Mean Depth (ft)	0.7	0.67	0.61	0.61 – 0.67
Width/Depth Ratio	12.9	14.93	19.87	14.93 – 19.87
Bankfull Cross Sectional Area (ft <sup>2</sup> )	6.3	6.75	7.38	6.75 – 7.38
Maximum Bankfull Depth (ft)	1.0	1.04	1.04	1.04
Floodprone Area (ft)	72-155	70	60	60 – 70
Entrenchment Ratio	9.0-17.2	7	4.95	4.95 – 7

\*Drainage Area, Floodprone Width, and Slope are averaged values only.

\*Riffle values are used for classification purposes.



## **2.3 Results of the Stream Assessment**

### **2.3.1 Site Data**

The assessment included the survey of four cross sections and the longitudinal profile of UT to Howell Branch Mitigation Site established by the NCDOT after construction. The length of the profile along UT to Howell Branch was approximately 535 linear feet. Four cross sections were established during the as-built. Cross section locations were subsequently based on the stationing of the longitudinal profile and are presented below. The location of the cross sections and longitudinal profile are shown in Appendix A.

- ◆ Cross Section #1. UT to Howell Branch, Station 155+50 linear feet, midpoint of riffle
- ◆ Cross Section #2. UT to Howell Branch, Station 251+00 linear feet, midpoint of pool
- ◆ Cross Section #3. UT to Howell Branch, Station 333+00 linear feet, midpoint of riffle
- ◆ Cross Section #4. UT to Howell Branch, Station 428+00 linear feet, midpoint of pool

Based on comparisons of the as-built to 2010 monitoring data, all four cross sections appear stable with little or no active bank erosion. Graphs of the cross sections are presented in Appendix A. Future survey data will vary depending on actual location of rod placement and alignment; however this information should remain similar in appearance. The longitudinal profile shows that the channel is stable for the 2010 monitoring evaluation.

## 2.4 Results of Stream and Buffer Vegetation

### 2.4.1 Description of Species

The following live stake species were planted on the streambank:

*Salix nigra*, Black Willow

*Cornus amomum*, Silky Dogwood

The following tree species were planted in the buffer area:

*Liriodendron tulipifera*, Tulip Poplar

*Platanus occidentalis*, American Sycamore

*Juglans nigra*, Black Walnut

*Betula nigra*, River Birch

### 2.4.2 Results of Vegetation Monitoring

**Buffer Vegetation:** One 50 ft. x 50 ft. vegetation plot and one 100 ft. x 25 ft. vegetation plot were set to determine the trees per acre in the buffer area.

**Table 2.** Vegetation Monitoring Results

Plot #	Tulip Poplar	American Sycamore	Black Walnut	River Birch	Total (Year 1)	Total (at planting)	Density (Trees/Acre)
1	3	7	1	3	14	37	257
2	1	4		11	16	37	294
Average Density (Trees/Acre)							276

**Site Notes:** The black willow and silky dogwood live stakes were surviving along sections of the streambank. Other vegetation noted included lespedeza, cattail, fennel, and various grasses.

### **2.4.3 Conclusions**

There were two vegetation monitoring plots established throughout the buffer area. The 2010 vegetation monitoring of the site revealed an average tree density of 276 trees per acre. This average is below the minimum success criteria of 320 trees per acre after year one monitoring. NCDOT is planning to replant the site by March 2011. NCDOT will continue to monitor the vegetation at the UT to Howell Branch Mitigation Site.

## **3.0 OVERALL CONCLUSIONS/RECOMMENDATIONS**

The UT to Howell Branch Mitigation Site has not met the required monitoring protocols for the first formal year of monitoring. The channel and structures throughout the stream are stable at this time. The streambank and buffer are not meeting planted vegetation success criteria for the first year of monitoring. NCDOT is planning to replant the site by March 2011. NCDOT will continue stream monitoring at the UT to Howell Branch Mitigation Site for 2011.

## **4.0 REFERENCES**

Natural Channel Design for UT to Howell Branch (Permit Site 5); Wayne County, NC, Rev. October 10, 2007.

As-Built Report for Stream Restoration on R-2554BA Permit Site 5, Wayne County, NC, February 26, 2010.

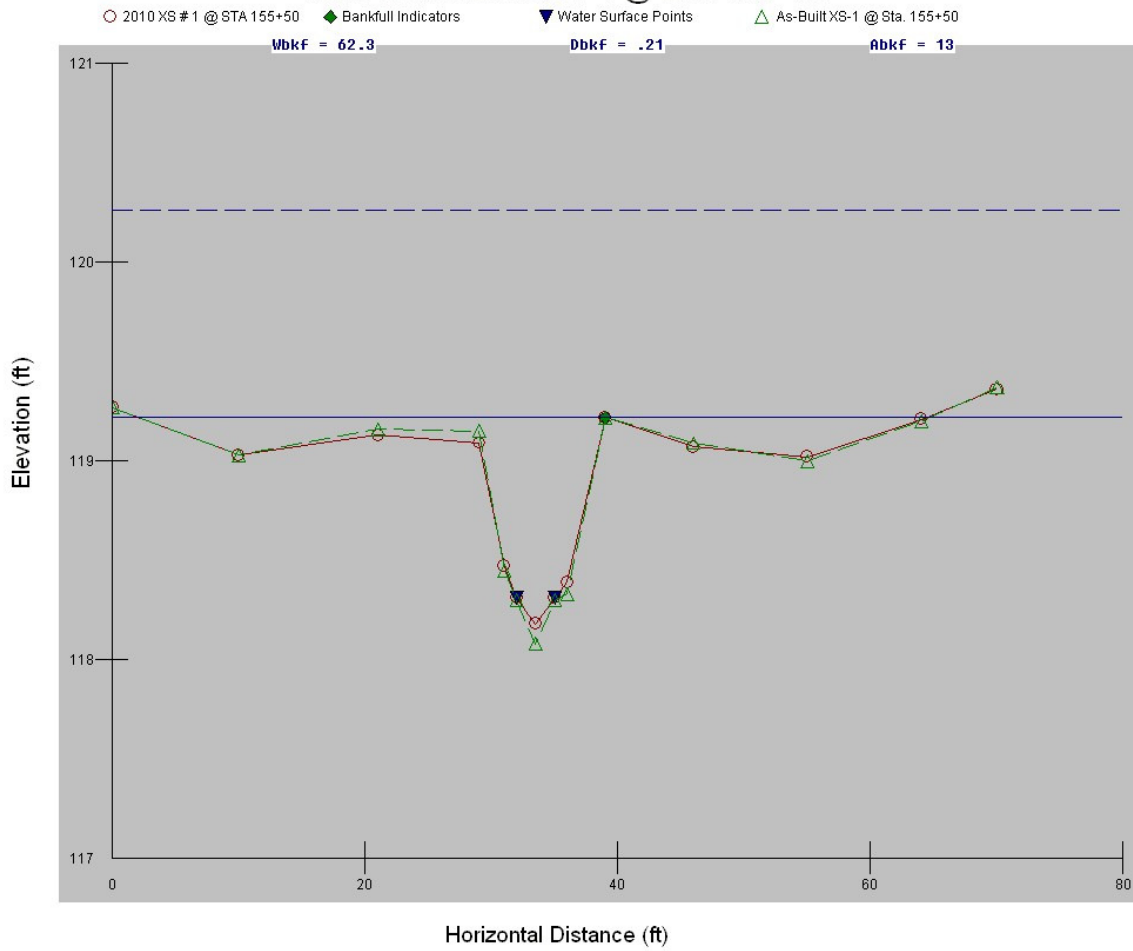
Rosgen, D.L, 1996. Applied River Morphology. Wildland Hydrology, Pagosa Springs, Colorado.

US Army Corps of Engineers (USACE), 2003. Stream Mitigation Guidelines. Prepared with cooperation from the US Environmental Protection Agency, NC Wildlife Resources Commission, and the NC Division of Water Quality.

**APPENDIX A**

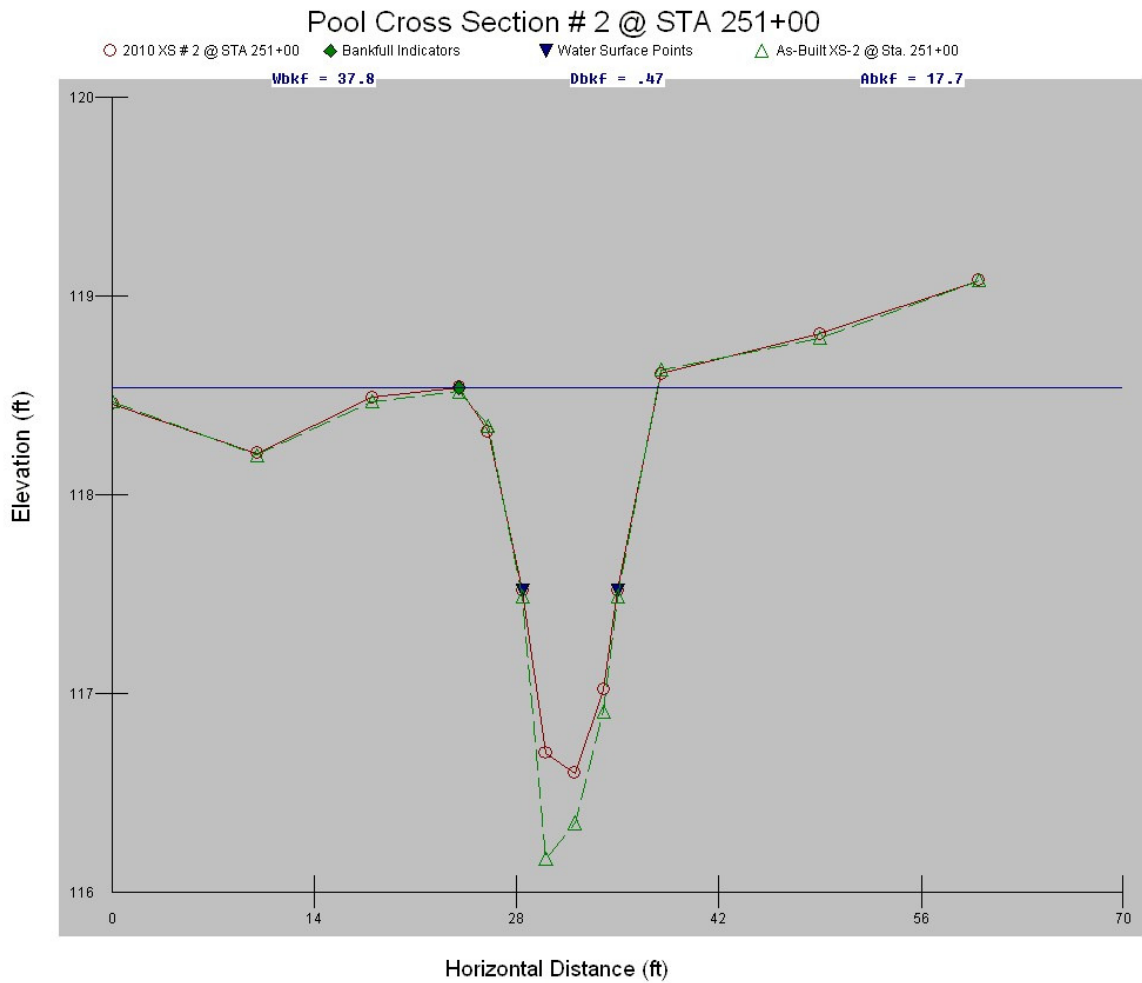
**CROSS SECTION COMPARISONS**  
**&**  
**LONGTITUDINAL PROFILE**

# Riffle Cross Section # 1 @ STA 155+50



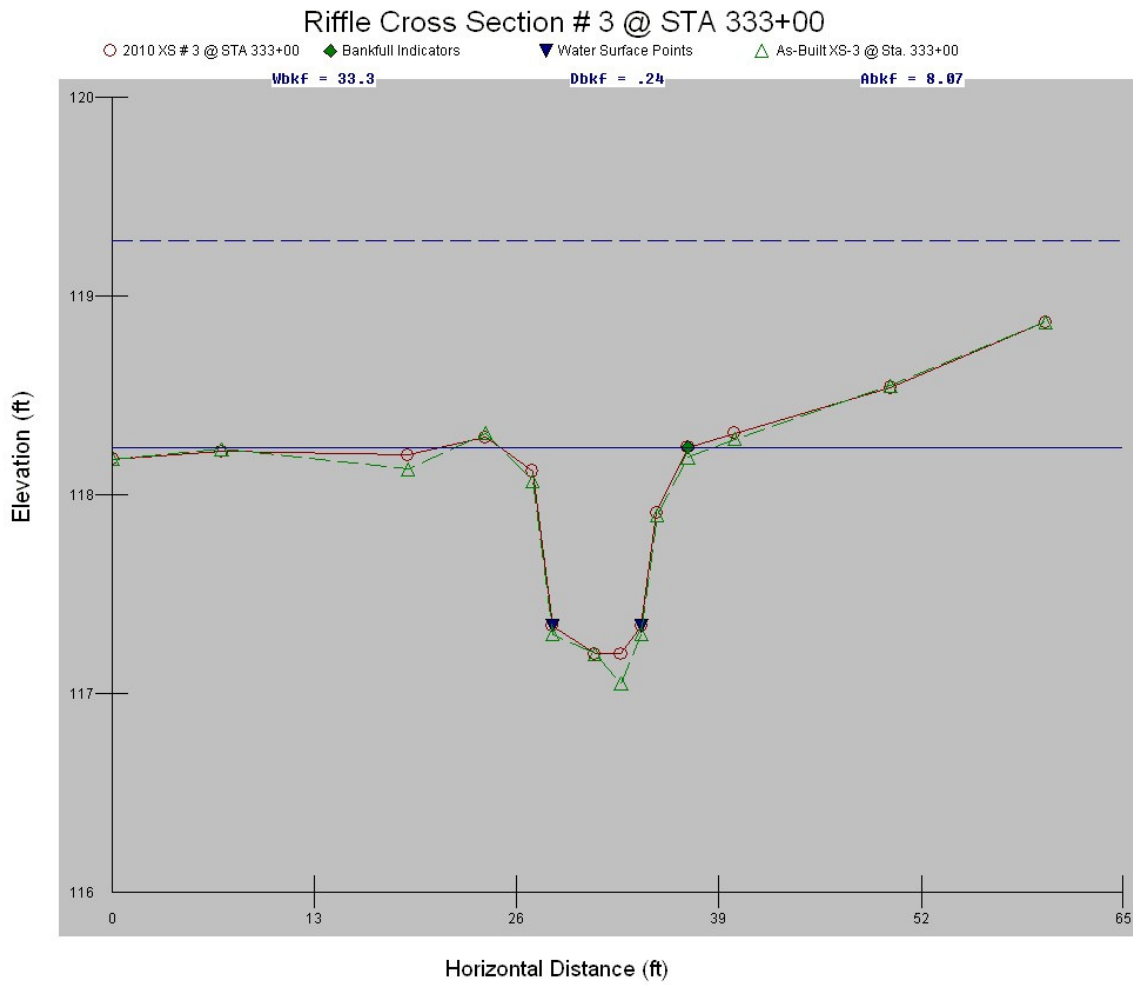
**Cross-Section #1 (Riffle) Abbreviated Morphological Summary**

	2010	2011	2012	2013	2014
Bankfull Width (ft)	10				
Bankfull Mean Depth (ft)	0.67				
Width/Depth Ratio	14.93				
Bankfull Cross Sectional Area (ft <sup>2</sup> )	6.75				
Maximum Bankfull Depth (ft)	1.04				
Width of the Floodprone Area (ft)	70				
Entrenchment Ratio	7				

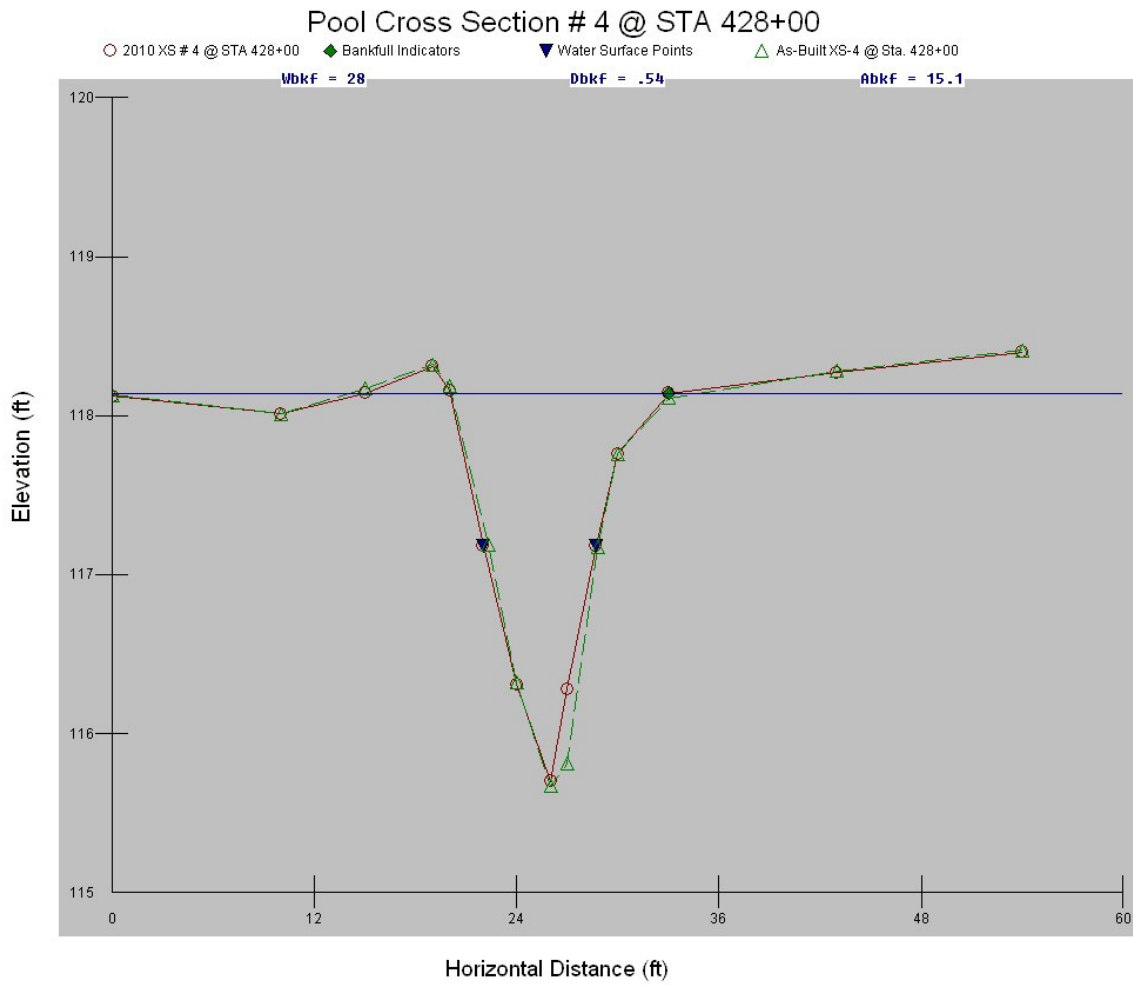


Cross-Section #2 (Pool) Abbreviated Morphological Summary*					
	2010	2011	2012	2013	2014
Bankfull Cross Sectional Area (ft <sup>2</sup> )	13.94				
Maximum Bankfull Depth (ft)	1.94				
Bankfull Mean Depth (ft)	1.01				
Bankfull Width (ft)	13.81				

\* According to the Rosgen Classification of Natural Rivers floodprone width, entrenchment ratio, and width depth ratio are not measured in pool, glide, or run features.



Cross-Section #3 (Riffle) Abbreviated Morphological Summary					
	2010	2011	2012	2013	2014
Bankfull Width (ft)	12.12				
Bankfull Mean Depth (ft)	0.61				
Width/Depth Ratio	19.87				
Bankfull Cross Sectional Area (ft <sup>2</sup> )	7.38				
Maximum Bankfull Depth (ft)	1.04				
Width of the Floodprone Area (ft)	60				
Entrenchment Ratio	4.95				

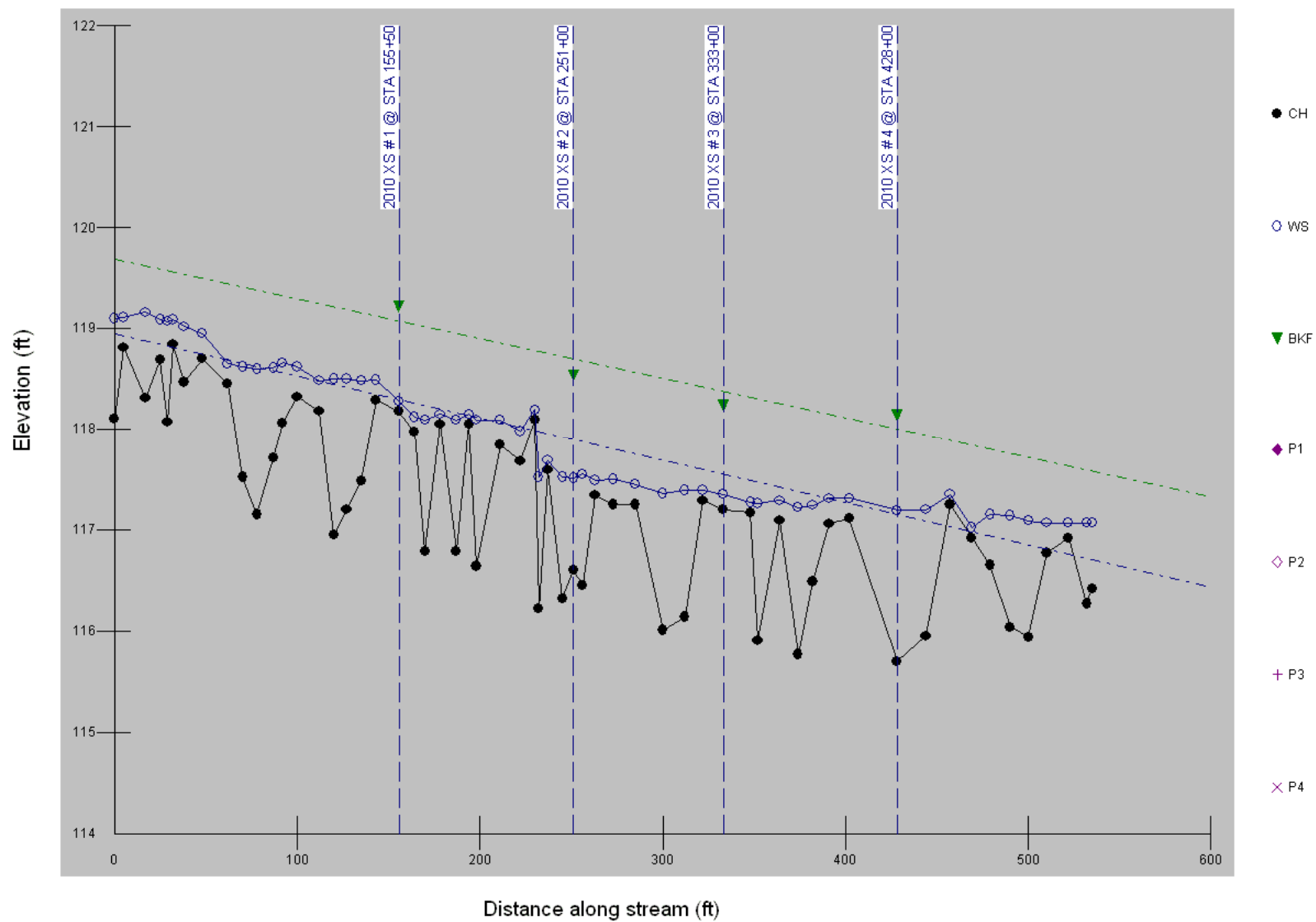


Cross-Section #4 (Pool) Abbreviated Morphological Summary*					
	2010	2011	2012	2013	2014
Bankfull Cross Sectional Area (ft <sup>2</sup> )	13.99				
Maximum Bankfull Depth (ft)	2.44				
Bankfull Mean Depth (ft)	1.08				
Bankfull Width (ft)	12.96				

\* According to the Rosgen Classification of Natural Rivers floodprone width, entrenchment ratio, and width depth ratio are not measured in pool, glide, or run features.



# UT to Howell Branch Long Pro (Site 5)



**APPENDIX B**

**SITE PHOTOGRAPHS, CROSS SECTION AND**

**PHOTO POINT LOCATIONS**

# UT to Howell Branch



Photo Point #1 (Upstream)



Photo Point #1 (Downstream)



Photo Point #2 (Upstream)



Photo Point #2 (Downstream)

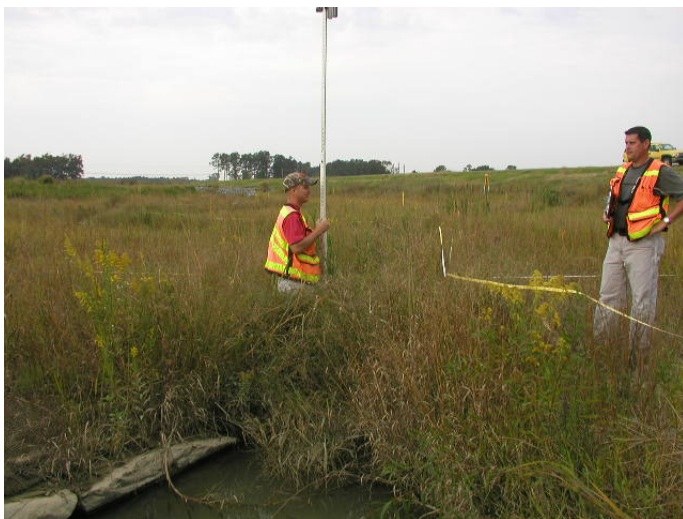


Photo Point #3 (Upstream)



Photo Point #3 (Downstream)

October 2010



# UT to Howell Branch



Photo Point #4 (Upstream)



Photo Point #4 (Downstream)

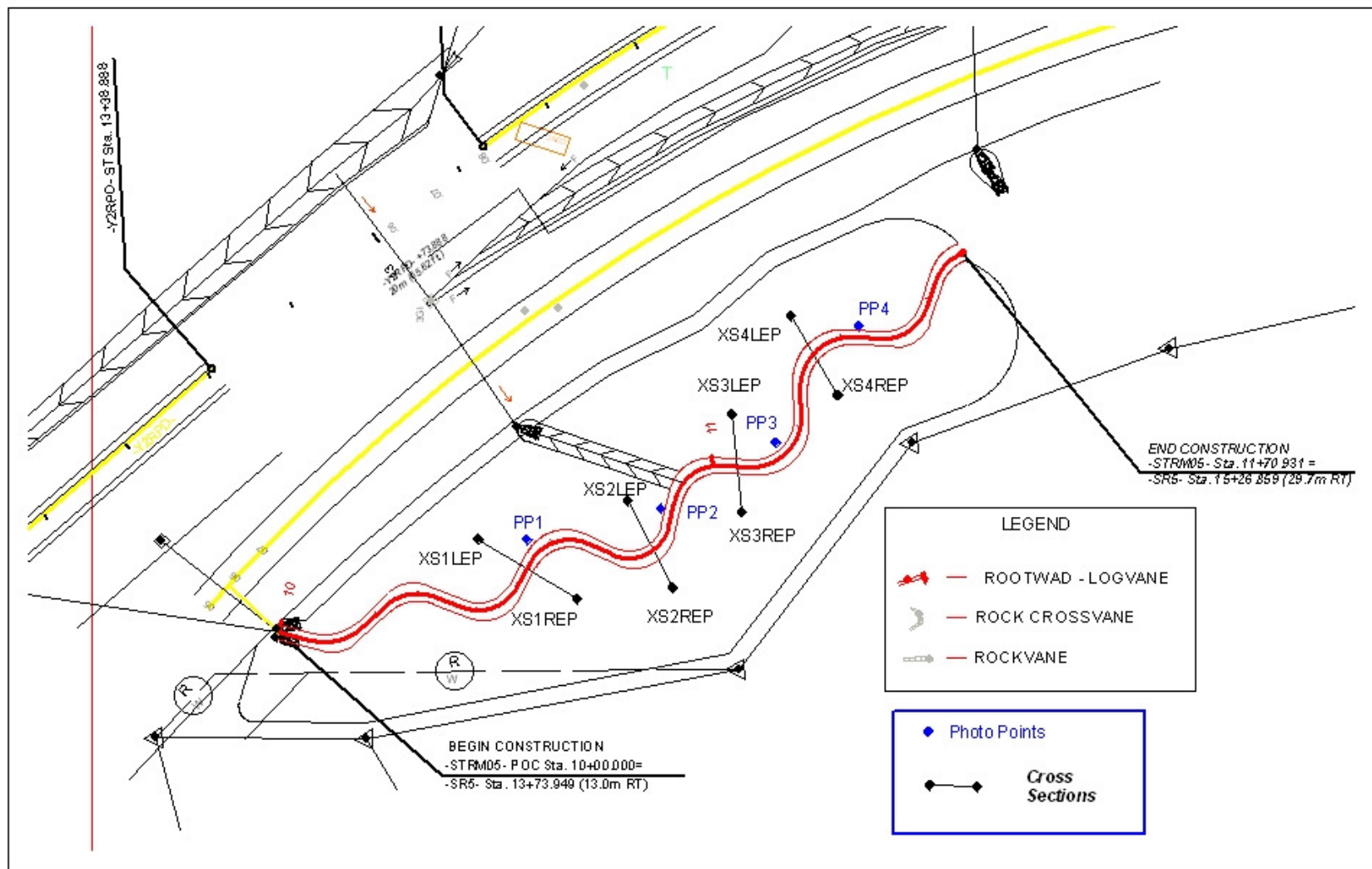


Vegetation Plot #1 taken from PP#1



Vegetation Plot #2 taken from PP#2

October 2010



**Photo Point and Cross Section Locations  
R-2554BA Site 5 UT to Howell Branch  
Wayne County, North Carolina**

